Name: _____ Date: _____

A2CC Q4T2 Review

$\pi = 180°$

**In addition to these questions, you also need to complete the June 2016 Part 1 (#1-24 skip2, 7, 9, 11)**

1. If $f(x)=10\sin(2x)+8$ then $f\left(\frac{\pi}{4}\right)=$ ?

$\frac{\pi}{4} = \frac{180}{4} = 45°$

(1) $4\sqrt{2}$ (3) 18

(2) 8 (4) $28\sqrt{3}$

$f(45°) = 10\sin(2(45)) + 8$
$= 10\sin(90) + 8$
$= 10(1) + 8$
$= 18$

2. Which of the following represents the range of the function $y=-6\sin(x)+10$?

(1) $-60 \le y \le 60$ (3) $-16 \le y \le 4$

(2) $0 \le y \le 20$ (4) $4 \le y \le 16$

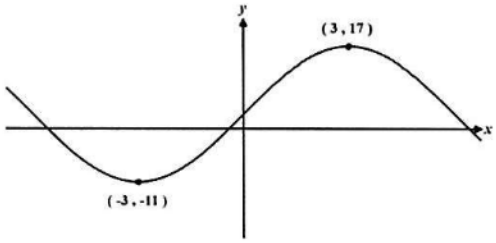
$|A| = 6$ highest $= 10+6 = 16$

$C = 10$ Lowest $= 10-6 = 4$

3. Given the sinusoidal graph with coordinates shown below, which of the following is the value of its amplitude?

(1) 14 (3) 12

(2) 6 (4) 28




$|A| = \frac{17-(-11)}{2} =$

$|A| = \frac{28}{2} = 14$

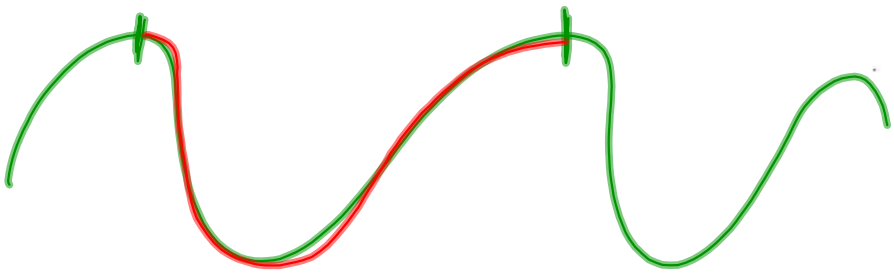
4. A periodic function has an equation $y=10\cos(8x)-2$. What is the horizontal distance between any two consecutive relative maximums on this graph?

Period

(1) 10 (3) 8

(2) $\frac{\pi}{2}$ (4) $\frac{\pi}{4}$

$\text{Period} = \frac{2\pi}{B} = \frac{2\pi}{8} = \frac{\pi}{4}$



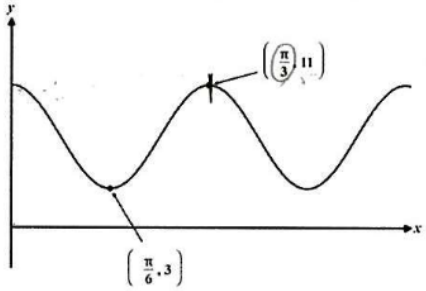
5. The graph shown below can be described using the equation $y = A\cos(Bx) + k$. Which of the following is the value of $B + k$?

(1) $5\pi$

(2) 13

(3) 11

(4) $\frac{\pi}{7}$




Period $= \frac{\pi}{3}$

$B = \frac{2\pi}{\pi/3} = 2\pi(\frac{3}{\pi}) = 6$

$K = \frac{11+3}{2} = 7$

$6 + 7 = 13$

6. Which of the following lines would the graph of $y = -5\sin(x) + 14$ not intersect?

(1) $x = 0$

(2) $x = \pi$

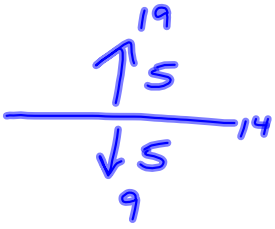
(3) $y = 20$

(4) $y = 9$

highest $= 14 + 5 = 19$

lowest $= 14 - 5 = 9$

$9 \le y \le 19$




7. A person riding a Ferris wheel at a local fair makes one complete trip around in 10 minutes. Their height c be modeled using a sine function of the form $y = A\sin(Bt) + C$, where $t$ is the amount of time the person has been traveling, in minutes. Which of the following must be the value of $B$?

(1) 10

(2) $\frac{1}{20}$

(3) $10\pi$

(4) $\frac{\pi}{5}$

Period $= 10$

$B = \frac{2\pi}{10} = \frac{\pi}{5}$

8. The volume of water in a tank varies periodically. At $t = 0$ it is at its maximum of 650 gallons and at $t = 5$ it is at its minimum of 120 gallons. Which of the following functions would best model the volume of water in this tank as a function of time in hours?

(1) $V = 265\cos\left(\frac{2\pi}{10}t\right) + 385$

(2) $V = -770\sin(10t) + 385$

(3) $V = -385\cos(5t) + 265$

(4) $V = 265\sin\left(\frac{\pi}{10}t\right) + 770$

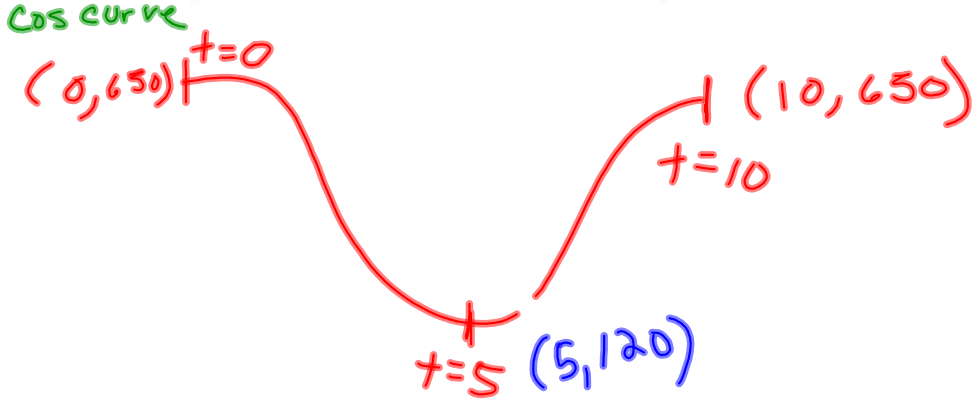
$A = \frac{650 - 120}{2} = 265$

Starts at max so A is (+) and its a cos function.

$B = \frac{2\pi}{\text{Period}} = \frac{2\pi}{10} = \frac{\pi}{5}$

$C = \frac{650 + 120}{2} = 385$

After 5 seconds it is half way therefore 10 seconds is the Period



9. The terminal ray of an angle drawn in standard position passes through the point (.508,.862) on the unit circle. Which of the following is closest to the tangent of this angle?

(1) .685 **(3) 1.697**

(2) 1.291 (4) 2.883

cos, sin

$\tan = \frac{\sin}{\cos} = \frac{.862}{.508} = 1.697$

y = sin
cos = x


10. If $\alpha$ is an angle drawn in the standard position with its terminal ray landing in the fourth quadrant and $\csc(\alpha) = -5$, then which of the following is the exact value of $\cos(\alpha)$?

(1) $-\frac{1}{5}$ **(3) $\frac{\sqrt{24}}{5}$**

(2) $-\frac{24}{25}$ (4) $\frac{\sqrt{6}}{2}$

cos is (+)

$\csc = -5$

$\sin = \frac{1}{-5}$

$\sin^2 + \cos^2 = 1$

$\left(\frac{-1}{5}\right)^2 + \cos^2 = 1$

$\frac{1}{25} + \cos^2 = 1$

$\cos^2 = \frac{24}{25}$

$\cos = \frac{\sqrt{24}}{5}$

11. For the angle $\theta$ it's known that $\cot(\theta) < 0$ and $\sin(\theta) > 0$. In which quadrant does the terminal ray of $\theta$ lie?

(1) I (3) III

**(2) II** (4) IV

cot < 0 (negative) in II IV

sin > 0 (Positive) in I II

S | A
T | C

12. For an angle $A$ it is known that $\sin A = \frac{3}{4}$ and $\cos A < 0$. Determine the value of $\tan A$. Show how you arrived at your answer.

$\sin^2 + \cos^2 = 1$

$\left(\frac{3}{4}\right)^2 + \cos^2 = 1$

$\frac{9}{16} + \cos^2 = 1$

$\cos^2 = \frac{7}{16}$

$\cos = \pm\frac{\sqrt{7}}{4}$

$\cos = -\frac{\sqrt{7}}{4}$

$\tan = \frac{\sin}{\cos} = \frac{\frac{3}{4}}{\frac{-\sqrt{7}}{4}} = \frac{3}{-\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}} = \frac{3\sqrt{7}}{-7}$

$\frac{-3\sqrt{7}}{7}$

13. For the function $f(x) = A\sin\left(\frac{\pi}{5}x\right) + k$, it is known that $f(3) = 7$. Explain why $f(13)$ must also equal 7.

10 (Full cycle)

$\text{Period} = \frac{2\pi}{\pi/5} = 2\pi \cdot \frac{5}{\pi} = 10$

Period = 10

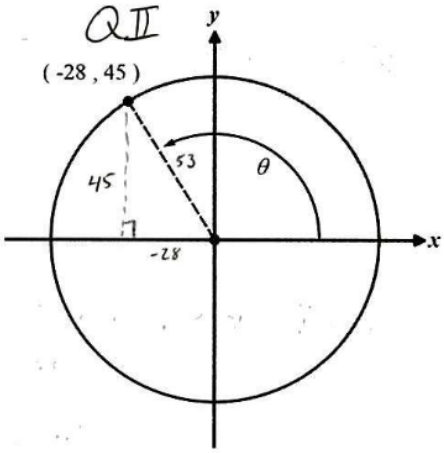
f(13) = 7 b/c that is one complete cycle.

14. For the function $f(x)=6\sin(10x)+8$, explain why the equation $f(x)=0$ would fail to have any solutions.

high = 8+6 = 14
low = 8-6 = 2
$2 \le y \le 14$
range

0 is not in the range

15. Given the following circle (note that it is **not** the **unit circle**) with the angle $\theta$ marked, state the values of each of the following:




(a) The radius of the circle $(-28)^2+(45)^2=r^2$
$784+2025=r^2$
$2809=r^2$
$r=53$

(b) $\sin\theta = \frac{O}{H}$
$= \frac{45}{53}$

(c) $\cos\theta = \frac{-28}{53}$

(d) $\tan\theta = \frac{45}{-28}$

(e) $\sec\theta = \frac{-53}{28}$

(f) $\csc\theta = \frac{53}{45}$

(g) $\cot\theta = \frac{-28}{45}$

16. A person's height, in feet above the ground, on a Ferris wheel can be modeled using the equation $h(t)=-45\cos\left(\frac{\pi t}{7}\right)+52$, where $t$ is the time the rider has been on the wheel in minutes. What is the maximum height the rider reaches and the time it takes to first reach this height if they get on at $t=0$. Explain how you arrived at your answer.

high = 52 + 45 = 97 feet  Period = $\frac{2\pi}{\pi/7}$ = 14

If we start @ bottom we reach max height at half of the period or 7 minutes

7. If the function $y = A\sin\left(\frac{\pi}{8}x\right) + C$ is graphed below, answer the following questions about point $D$ marked.

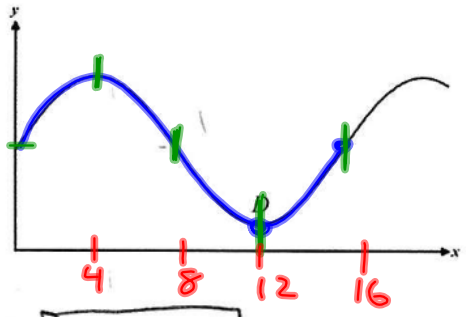
(a) What is the numerical value of the $x$-coordinate of point $D$? Show how you arrived at your answer.

D is @ 3/4 of the full sin curve or at 3/4(Period)

Period $= \frac{2\pi}{\pi/8} = 2\pi \cdot \frac{8}{\pi} = 16$ $\quad \frac{3}{4}(16) = \boxed{12}$

(b) What is the $y$-coordinate of $D$ in terms of the constants $A$ and $C$?

D is @ Lowest value. Lowest is C-A




$\boxed{D = C - A}$

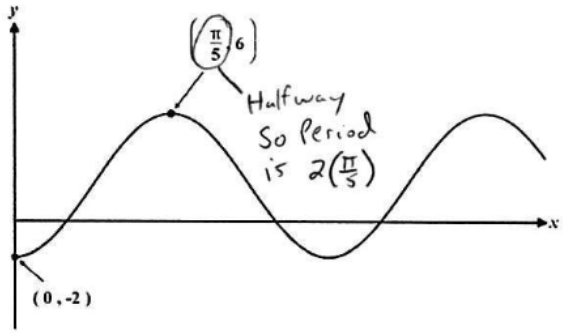
18. The graph shown below can be modeled using the equation $y = A\cos(Bx) + C$. Determine the values of $A$, $B$, and $C$. Show how you arrived at your results.

$|A| = \frac{6-(-2)}{2} = \frac{8}{2} = 4$ Start @ bottom

$B = \frac{2\pi}{2\pi/5} = 2\pi \cdot \frac{5}{2\pi} = 5$

$C = \frac{6+(-2)}{2} = \frac{4}{2} = 2$

$\boxed{A = -4 \quad B = 5 \quad C = 2}$




19. Which of the following could *not* be the probability that event A occurs?

(1) $\frac{3}{5}$ (3) 1.25 Bigger than 1

(2) 0.49 (4) $\frac{1}{2}$

20. The following table shows the results of a survey of people in terms of what type of breakfast they prefer. Based on the table, what is the probability that a person picked at random is over 40 and eats eggs for breakfast?

(1) 0.32 (3) 0.63

(2) 0.47 (4) 0.8

| | Eats Cereal | Eats Eggs | |
|---|---|---|---|
| 40 and under | 23 | 17 | = 40 |
| Over 40 | 21 | 29 | = 50 |
| | | | 90 |

$\frac{29}{90}$

1 (2) (3) (4) 5 (6)

21. If a standard six sided die is rolled once, what is the probability that the number rolled is either an even or a multiple of 3?

(1) $\frac{1}{6}$ (3) $\frac{5}{6}$

(2) $\frac{1}{2}$ (4) $\frac{2}{3}$

$P(\text{Even or multiple of 3}) = P(\text{Even}) + P(\text{multiple of 3}) - P(\text{Even and multiple of 3})$

$= \frac{3}{6} + \frac{2}{6} - \frac{1}{6} = \frac{4}{6} = \frac{2}{3}$

22. Prime numbers are positive integers that are only divisible by 1 and themselves, i.e. the set $\{2, 3, 5, 7, ...\}$. If a random number is generated from 1 to 20, what is the probability that it is *not* prime?

(1) 0.2 (3) 0.6

(2) 0.5 (4) 0.8

1 (2) (3) 4 (5) 6 (7) 8 9 10

(11) 12 (13) 14 15 16 (17) 18 (19) 20

Circled are prime

$P(\text{not Prime}) = \frac{12}{20} = .6$

23. Of all the tourists who visit Florida, 38% of them will visit an amusement park and 54% will visit a beach. If 22% will visit both an amusement park and a beach, then what percent will visit either a park or a beach?

(1) 16% (3) 30%

(2) 70% (4) 92%

$P(\text{Park or Beach}) = P(\text{Park}) + P(\text{Beach}) - P(\text{both})$

$= .38 + .54 - .22$

$= .70$

24. If a restaurant is chosen at random in Rhinebeck then there is an 84% chance that it is open on Sunday and a 42% chance that it is open on Monday. If there is a 96% chance it is open on either Sunday or Monday, what is the probability that it is open both days?

(1) 30% (3) 44%

(2) 38% (4) 50%

$P(\text{Sun or Mon}) = P(\text{Sun}) + P(\text{Mon}) - P(\text{Both})$

$.96 = .84 + .42 - P(\text{Both})$

$.96 = 1.26 - P(\text{Both})$

$-.3 = -P(\text{Both})$

$.3 = P(\text{Both})$

**DO NOT FORGET TO DO THE JUNE 2016 PART 1 (SKIP #2, 7, 9, 11)**

Use this space for computations.

**1** When $b > 0$ and $d$ is a positive integer, the expression $(3b)^{\frac{2}{d}}$ is equivalent to

(1) $\frac{1}{\left(\sqrt[d]{3b}\right)^2}$

(2) $\left(\sqrt{3b}\right)^d$

(3) $\frac{1}{\sqrt{3b^d}}$

(4) $\left(\sqrt[d]{3b}\right)^2$

**2** Julie averaged 85 on the first three tests of the semester in her mathematics class. If she scores 93 on each of the remaining tests, her average will be 90. Which equation could be used to determine how many tests, $T$, are left in the semester?

85 x 3

(1) $\frac{255 + 93T}{3T} = 90$

(2) $\frac{255 + 90T}{3T} = 93$

(3) $\frac{255 + 93T}{T + 3} = 90$

(4) $\frac{255 + 90T}{T + 3} = 93$

**3** Given $i$ is the imaginary unit, $(2 - yi)^2$ in simplest form is

(1) $y^2 - 4yi + 4$

(2) $-y^2 - 4yi + 4$

(3) $-y^2 + 4$

(4) $y^2 + 4$

$(2 - yi)(2 - yi)$

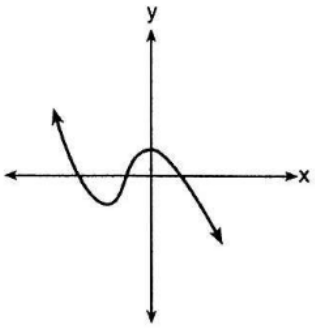
$4 - 4yi + y^2 i^2$

$-y^2 - 4yi + 4$

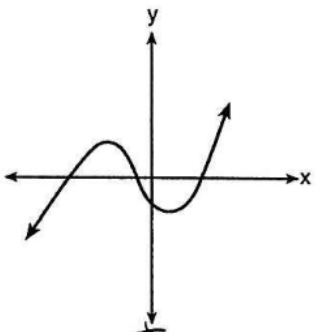
**Use this space for computations.**

4 Which graph has the following characteristics?

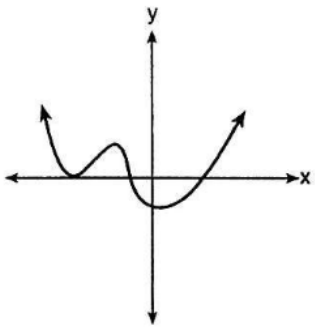
- three real zeros
- as $x \to -\infty$, $f(x) \to -\infty$
- as $x \to \infty$, $f(x) \to \infty$



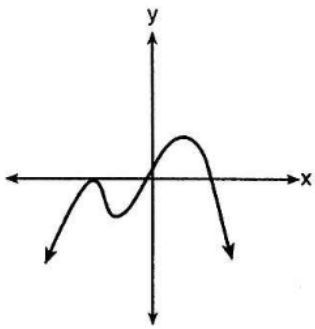

(1)




(3)




(2)




(4)

5 The solution set for the equation $\sqrt{56 - x} = x$ is

(1) $\{-8,7\}$
(3) $\{7\}$
(2) $\{-7,8\}$
(4) $\{\}$

$56 - x = x^2$
$0 = x^2 + x - 56$
$0 = (x+8)(x-7)$
$x = -8, 7$
extraneous

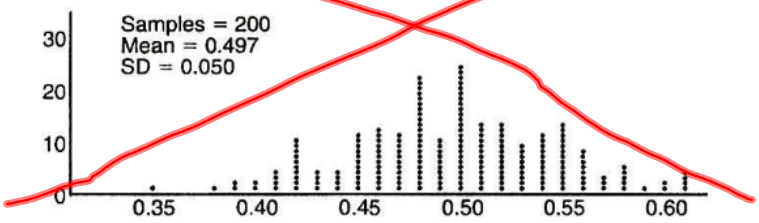
**Use this space for computations.**

6 The zeros for $f(x) = x^4 - 4x^3 - 9x^2 + 36x$ are

(1) $\{0, \pm 3, 4\}$
(2) $\{0, 3, 4\}$
(3) $\{0, \pm 3, -4\}$
(4) $\{0, 3, -4\}$

$x(x^3 - 4x^2 - 9x + 36) = 0$
$x(x^2(x-4) - 9(x-4)) = 0$
$x(x^2 - 9)(x-4) = 0$
$x(x+3)(x-3)(x-4) = 0$

7 Anne has a coin. She does not know if it is a fair coin. She flipped the coin 100 times and obtained 73 heads and 27 tails. She ran a computer simulation of 200 samples of 100 fair coin flips. The output of the proportion of heads is shown below.




$x^2y - 9y$
$y(x^2 - 9)$

Given the results of her coin flips and of her computer simulation, which statement is most accurate?

(1) 73 of the computer's next 100 coin flips will be heads.
(2) 50 of her next 100 coin flips will be heads.
(3) Her coin is not fair.
(4) Her coin is fair.

8 If $g(c) = 1 - c^2$ and $m(c) = c + 1$, then which statement is *not* true?

(1) $g(c) \cdot m(c) = 1 + c - c^2 - c^3$
(2) $g(c) + m(c) = 2 + c - c^2$
(3) $m(c) - g(c) = c + c^2$
(4) $\frac{m(c)}{g(c)} = \frac{-1}{1-c}$

$\frac{m(c)}{g(c)} = \frac{c+1}{1-c^2} = \frac{c+1}{(1-c)(1+c)} = \frac{1}{1-c}$

**10** The formula below can be used to model which scenario?

$$a_1 = 3000$$
$$a_n = 0.80a_{n-1}$$

(1) The first row of a stadium has 3000 seats, and each row thereafter has 80 more seats than the row in front of it.

(2) The last row of a stadium has 3000 seats, and each row before it has 80 fewer seats than the row behind it.

(3) A bank account starts with a deposit of \$3000, and each year it grows by 80%.

(4) The initial value of a specialty toy is \$3000, and its value each of the following years is 20% less.

**11** Sean's team has a baseball game tomorrow. He pitches 50% of the games. There is a 40% chance of rain during the game tomorrow. If the probability that it rains given that Sean pitches is 40%, it can be concluded that these two events are

(1) independent
(2) dependent
(3) mutually exclusive
(4) complements

$P(R) = P(R \mid S)$

Use this space for computations.

**12** A solution of the equation $2x^2 + 3x + 2 = 0$ is

(1) $-\frac{3}{4} + \frac{1}{4}i\sqrt{7}$ (3) $-\frac{3}{4} + \frac{1}{4}\sqrt{7}$

(2) $-\frac{3}{4} + \frac{7}{4}i$ (4) $\frac{1}{2}$

$x = \frac{-3 \pm \sqrt{3^2 - 4(2)(2)}}{2(2)}$

$\frac{-3 \pm \sqrt{-7}}{4}$

$-\frac{3}{4} \pm \frac{i\sqrt{7}}{4}$

**13** The Ferris wheel at the landmark Navy Pier in Chicago takes 7 minutes to make one full rotation. The height, $H$, in feet, above the ground of one of the six-person cars can be modeled by $H(t) = 70 \sin\left(\frac{2\pi}{7}(t - 1.75)\right) + 80$, where $t$ is time, in minutes. Using $H(t)$ for one full rotation, this car's minimum height, in feet, is

(1) 150 (3) 10

(2) 70 (4) 0

$70(-1) + 80$

$-70 + 80 = 10$

**14** The expression $\frac{4x^3 + 5x + 10}{2x + 3}$ is equivalent to

(1) $2x^2 + 3x - 7 + \frac{31}{2x + 3}$ (3) $2x^2 + 2.5x + 5 + \frac{15}{2x + 3}$

(2) $2x^2 - 3x + 7 - \frac{11}{2x + 3}$ (4) $2x^2 - 2.5x - 5 - \frac{20}{2x + 3}$

$2x^2 - 3x + 7$

$2x+3 \overline{)4x^3 + 0x^2 + 5x + 10}$

$4x^3 + 6x^2$

$-6x^2 + 5x$

$-6x^2 - 9x$

$14x + 10$

$14x + 21$

$-11$

**15** Which function represents exponential decay?

(1) $y = 2^{0.3t}$ (3) $y = \left(\frac{1}{2}\right)^{-t} = 2^t$

(2) $y = 1.2^{3t}$ (4) $y = 5^{-t}$

$\left(\frac{1}{5}\right)^t \rightarrow 5^{-t} = \left(\frac{1}{5}\right)^t$

Use this space for computations.

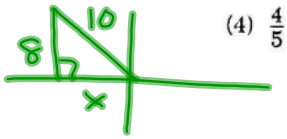
16 Given $f^{-1}(x) = -\frac{3}{4}x + 2$, which equation represents $f(x)$?

(1) $f(x) = \frac{4}{3}x - \frac{8}{3}$
(3) $f(x) = \frac{3}{4}x - 2$
(2) $f(x) = -\frac{4}{3}x + \frac{8}{3}$
(4) $f(x) = -\frac{3}{4}x + 2$

$x = -\frac{3}{4}y + 2$
$-4x = 3y - 8$
$-4x + 8 = 3y$
$-\frac{4}{3}x + \frac{8}{3} = y$

17 A circle centered at the origin has a radius of 10 units. The terminal side of an angle, $\theta$, intercepts the circle in Quadrant II at point $C$. The $y$-coordinate of point $C$ is 8. What is the value of $\cos\theta$?

(1) $-\frac{3}{5}$
(3) $\frac{3}{5}$
(2) $-\frac{3}{4}$
(4) $\frac{4}{5}$




Since $\theta$ terminates in Quadrant II, $\cos\theta$ is negative.
$\sqrt{10^2 - 8^2} = 6$ $\frac{-6}{10} = -\frac{3}{5}$

18 Which statement about the graph of $c(x) = \log_6 x$ is *false*?

(1) The asymptote has equation $y = 0$.
(2) The graph has no $y$-intercept.
(3) The domain is the set of positive reals.
(4) The range is the set of all real numbers.

The asymptote has equation $x = 0$

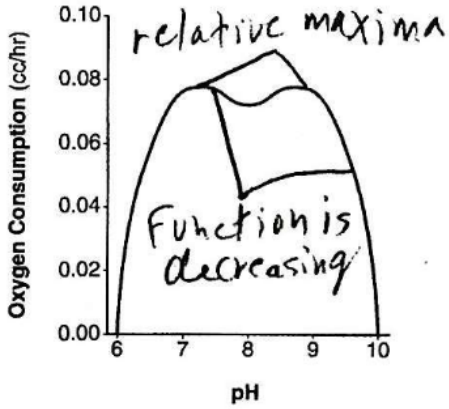
19 The equation $4x^2 - 24x + 4y^2 + 72y = 76$ is equivalent to

(1) $4(x - 3)^2 + 4(y + 9)^2 = 76$
(2) $4(x - 3)^2 + 4(y + 9)^2 = 121$
(3) $4(x - 3)^2 + 4(y + 9)^2 = 166$
(4) $4(x - 3)^2 + 4(y + 9)^2 = 436$

$4(x^2 - 6x + 9) + 4(y^2 + 18y + 81) = 436$
$4(x - 3)^2 + 4(y + 9)^2 = 436$

Use this space for computations.

**20** There was a study done on oxygen consumption of snails as a function of pH, and the result was a degree 4 polynomial function whose graph is shown below.




Which statement about this function is *incorrect*?

(1) The degree of the polynomial is even. degree is 4

(2) There is a positive leading coefficient.

(3) At two pH values, there is a relative maximum value.

(4) There are two intervals where the function is decreasing.

**21** Last year, the total revenue for Home Style, a national restaurant chain, increased 5.25% over the previous year. If this trend were to continue, which expression could the company's chief financial officer use to approximate their monthly percent increase in revenue? [Let $m$ represent months.]

(1) $(1.0525)^m$

(2) $(1.0525)^{\frac{12}{m}}$

(3) $(1.00427)^m$

(4) $(1.00427)^{\frac{m}{12}}$

$1.0525^{1/12} - 1.00427$

$\left(1 + \frac{.0525}{12}\right)^1$

$\frac{M}{12} = \frac{1}{12} \cdot m$

$(1.0525)^{\frac{m}{12}}$

$\left((1.0525)^{1/12}\right)^m$

**Use this space for computations.**

**22** Which value, to the *nearest tenth*, is *not* a solution of $p(x) = q(x)$ if $p(x) = x^3 + 3x^2 - 3x - 1$ and $q(x) = 3x + 8$?

(1) $-3.9$
(2) $-1.1$
(3) 2.1
(4) 4.7

Use graphing calculator

**23** The population of Jamesburg for the years 2010 – 2013, respectively, was reported as follows:

250,000 250,937 251,878 252,822

How can this sequence be recursively modeled?

(1) $j_n = 250{,}000(1.00375)^{n-1}$

(2) $j_n = 250{,}000 + 937^{(n-1)}$

(3) $j_1 = 250{,}000$
$j_n = 1.00375 j_{n-1}$

(4) $j_1 = 250{,}000$
$j_n = j_{n-1} + 937$

**24** The voltage used by most households can be modeled by a sine function. The maximum voltage is 120 volts, and there are 60 cycles *every second*. Which equation best represents the value of the voltage as it flows through the electric wires, where $t$ is time in seconds?

(1) $V = 120 \sin(t)$
(2) $V = 120 \sin(60t)$
(3) $V = 120 \sin(60\pi t)$
(4) $V = 120 \sin(120\pi t)$

$\text{period} = \frac{2\pi}{B}$

$\frac{1}{60} = \frac{2\pi}{B}$

$B = 120\pi$

$B = \frac{2\pi}{1/60} = 2\pi \cdot \frac{60}{1} = 120\pi$

**Part II**

**Answer all 8 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil.** [16]

**25** Solve for $x$: $\frac{1}{x} - \frac{1}{3} = -\frac{1}{3x}$

$\frac{3-x}{3x} = \frac{-1}{3x}$

$3 - x = -1$

$4 = x$